

Planning a Plenty*

Time

one to three 45- to 60-minute periods

Vocabulary

aquatic, channel, channelization, floodplain, habitat, healthy, land-use planning, lifestyle, pollutant, pollution, population, watershed

Objectives

Students will be able to:

- ☐ evaluate the effects of different kinds of land use on riverine habitats.
- ☐ discuss and evaluate **lifestyle** (individual's way of life) changes to minimize damaging effects on rivers.

Method

Students create a collage of human land-use activities around an image of a river.

Materials

For each team:

scissors

masking tape

paper

list of land uses

1 *Map of the Cedar River*

large piece of paper (18" x 24") for each small group

Background

The Dragoons crossed many rivers during their expedition in the summer of 1835. While crossing the Cedar River (near present day Osage), Lieutenant Albert Lea noticed the river to be about 35 yards wide, 2½ feet deep, swift, clear, and having a gravelly bottom. Albert Lea noticed limestone bluffs located periodically on the river. He also noted that there were "(n)o falls or rapids...on the river." Boats were reported to have ascended the river annually and Lea thought the river to be navigable to its sources several months out of the year. There was not a permanent human settlement at this location.

The Cedar River originates in southwestern Minnesota, travels east/southeast through central Iowa, and empties into the Iowa River in Louisa County. At the time of the Dragoon's crossing, few recorded Euro-Americans lived in its 6,720 square mile watershed. As of 2000, over 261,000 people live along the Cedar River alone.

Since the earliest times, humans have planned the arrangement of housing in regular, rectangular patterns. Civic and religious buildings are placed in prominent locations. These patterns not only give structure to American cities, but they also affect wildlife **habitat** (arrangement of food, water, shelter or cover, and space suitable to animals' needs) and **populations** (number of a particular species in a defined area at a given time). Some people perceive undeveloped areas as raw material for human use, while others believe natural environments are to be preserved without regard for human needs. Still

*Based on the activity "*Dragonfly Pond*," Project WILD Aquatic K-12 Curriculum & Activity Guide, Council for Environmental Education, Houston, Texas, 2001.

others feel there should be a balance, maintaining a **healthy** (supports the diversity of life) natural environment should be incorporated into development to meet human needs.

Growth in natural systems is limited by the available energy in the system. Energy in natural systems is translated into food, water, shelter, space, and continued survival. The microbes in the soil are just as necessary to a habitat as plants and predators.

Human land use can disturb the natural balance of our ecosystems. Growth in human activities often can go beyond the natural limits of a setting. Humans can import energy sources and other resources or they can remove energy sources from a system.

Rivers and their **floodplain** (land near a stream/river which flood water spills onto) forests, wetlands, sloughs, and backwaters provide habitat for a variety of plants and animals. Wetlands play a very special role in filtering **pollutants** (substances that may contaminate air, water, or soil) out of the water. River and stream systems often are altered to accommodate human wants or needs. Hundreds of miles of river and stream shoreline and thousands of acres of wetlands and floodplain forests are lost each year to channelization, draining, dredging, filling, **pollution** (contamination of soil, water, or atmosphere by the discharge of harmful substances), and development. Iowa has lost more than 3,000 miles of interior rivers to **channelization** (straightening). Engineering work for navigation on the Missouri River reduced the **channel** (deeper part of a moving body of water where the main current flows) area by more than 35,000 acres along Iowa alone.

One of the major challenges facing our society is how to regulate growth and conserve open spaces. Students will struggle with the arrangement of land uses in an effort to preserve a section of the Cedar River's habitat. When students reach some kind of agreement about local issues, the activity shifts to how their consensus affects riverine habitat and people downstream. The activity ends with consideration of the idea that everyone lives downstream.

For more information on the Albert Lea or the Dragoons, refer to *Iowa's Water*, page 4.

Procedure

1. Discuss the Dragoon's 1835 journey through Iowa and southeastern Minnesota. Share the *background information* from above.
2. Explain to students that during this activity they will use the Cedar River as a microcosm of environmental concerns involved in making **land-use planning** (planning of how the land will be used by people) decisions. Copy the *Map of the Cedar River* on the board or overhead.
3. Ask students how the land in the river's **watershed** (land that drains to the river) might be used. Compile a list of their ideas on the board or an overhead. Some land uses include: farm fields, factories (can list specific types in your area), houses, apartments, roads, shopping centers/stores, natural areas, wetlands, prairies, forests, schools, gravel pit, animal feed lot.
4. Divide the class into teams of four or five, with each student representing one of the interest groups described below. Students will stay in these groups until the end of the activity. Possible interest groups to include are:
 - Residents – want to live in the area
 - Farmers – want to use the land to raise food and livestock
 - Conservationists – want to maintain the land as wildlife habitat
 - Business interests – want to use the land for commerce and economic growth
 - Gas station owners – want to make a living in servicing and repairing vehicles
 - Parks and recreation department personnel – want people to have a place for recreation
 - Water treatment personnel – want to sell clean water to residents
 - Highway department personnel – want to maintain access in the area
 - Factory representatives – want to preserve jobs and commerce

NOTE: Add other interest groups that may be important locally

5. Distribute 18" x 24" pieces of paper that will serve as the base map for each team's river and its associated land uses. Have students copy the *Map of the Cedar River* and the list of land uses from the board. All land uses must be incorporated in their maps. Students can make the land use larger or smaller in their map of the area or they may include additional land uses. When finished, the maps should be completely covered in land uses, no blank areas. Suggest to students that they may want to create a working map first, then create the final map of land uses after they have reached agreement about location and size of each land use.
6. When students are ready to begin the process of making land-use decisions, have them create a list of benefits and costs for each land use. Guide the class discussion so that they consider the consequences of each land use. Record these lists on the chalkboard. Following are a few examples:

Farms

Benefit

- produce food
- add economic value
- provide jobs through seasonal employment

Cost

- use pesticides (herbicides, insecticides) that may damage people and the environment
- become source of soil erosion
- sometimes drain wetlands for farm land

Businesses

Benefit

- provide employment
- provide commerce
- create economic stability

Cost

- produce wastes and sewages
- may contaminate water (detergents, pesticides)
- use chemical fertilizers (lawns, etc.

7. Have students work in the teams for 30 to 45 minutes.
8. Have each team display its base map and report on the work in progress. Encourage discussion of the students' choices emphasizing that:
 - no land use can be excluded, and
 - consensus (an agreement among all parties) must be built around each decision.Discuss consequences of the students' proposed land-use plan. Be firm about the issues, but fair about this being a very difficult set of choices.
9. Continue the discussion by asking more teams to share their proposed plans. What would happen if the factory and businesses were to close? Abandoning the farm would have what effects? Do farmlands provide habitat for some wildlife? What happens if wetlands are drained to create farmland?
10. Give students additional time working in their teams to decide on the best possible land-use plan under the circumstances. Being sensitive to their frustrations, display all final land-use plans. Analyze and discuss the merits of each approach. Point out that although their solutions may not be perfect, they can minimize the damage to the Cedar River.
11. Choose one of the team's base maps and continue the Cedar River downstream. The students may have dumped effluent below their section of the river and let it flow downstream. Show the route the stream might travel. On the drawing, have the Cedar River flow into the Iowa River. Continue drawing to the Mississippi River and finally to the Gulf of Mexico. You may also connect several of the teams' maps together, one above another, to indicate the flow downstream.

12. Ask students to brainstorm possible problems in each of these **aquatic** (growing, living in, or frequenting water) systems as a result of human activities on the Cedar River. What might be potential consequences of such activities? For example, you could emphasize the effluent from the factory. How will it be treated? Where? By whom? Where will it go? With what effects?
13. Ask the students to examine all of the land uses in this activity. What could people who are actually in charge of various land uses do to minimize damage to the Cedar River? End with an emphasis on solutions rather than problems. Point out, for example, they could “mine” industrial effluents through “scrubbers” to extract wastes as profitable resources. Farmers may employ conservation tillage practices. ... Petroleum wastes could be recycled.

Evaluation

1. How has the Cedar River changed since the Dragoons traveled it?
2. What are three ways people can reduce or prevent damage to rivers?
3. Under what conditions, if any, do you think these actions to reduce damage to rivers would be appropriate? Inappropriate? Select any action that you think would be appropriate and that you could take to reduce or prevent damage to floodplain wetlands. Write a one-page paper about your plan.

Extensions

Visit the ortho map server (ortho.gis.iastate.edu/) and print aerial photographs of the land near the Cedar River (or a local river) and research actual land use in the watershed. How might land uses negatively impact the quality of the water? What are some ways impacts might be minimized?

Perform this activity using a local stream or river instead of the Cedar River.

Locate a river or stream in your community. Determine the overall quality of the river, stream, forests, or wetlands with which it is connected.

Trace any stream or river system that passes through your community from its source to its entrance into the ocean. List all sites you can identify that lower the quality of the waters in their journey and suggest how to reverse or minimize the process.

Research the history of your county through local historical societies and the state historical society. How have land-use practices changed since 1835?

Learn more about environmental impact statements. Obtain actual copies of statements about rivers in your area. What concerns are addressed in those documents?

Research zoning laws and land-use regulations in your area. Would the plan your group proposed be allowed in your community?

Teacher Aids

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“Biodiversity of Iowa: Aquatic Habitats.” 2001. Des Moines: Iowa Department of Natural Resources’ Aquatic Education Program.

“Living Landscape.” Conservation Technology Information Center.

Planning a Plenty: Map of the Cedar River

